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PROCEEDINGS OF THE SOCIETY OF PUBLIC ANALYSTS.

SUMMER MEETING.

The annual summer meeting of the Society of Public Analysts was held on July 18th at the College of Surgeons, Dublin. Sir Charles Cameron, the President, occupied the chair. Among those present were Professor Tichborne, Dr. Lapper, Mr. A. H. Allen, Mr. M. A. Adams, Mr. Otto Hehner, Mr. A. Smetham, Dr. F. L. Teed, Mr. James Baynes, Mr. Wallis Jenkins, Dr. S. Roche, Mr. Rowland Williams, Mr. MacAllan, Mr. Francis, Dr. Bernard Dyer, and a number of ladies.

The President, in opening the proceedings, said that his first duty was on behalf of the local members of the Society to give a cordial welcome to the members from the other side of the Channel. This was not the first time that the summer meeting of the Society had been held in Ireland; it was, in fact, the third occasion. Twelve years ago, when the British Association met in Dublin, there was a meeting of the Association held in that College, and eight years ago also the summer meeting and dinner in connection with the Association was held in that College. This was the third time that they had assembled there.

Mr. Otto Hehner temporarily took the chair whilst Sir Charles Cameron read his paper on "The Results of the Working of the Adulteration Acts in Dublin."

A discussion followed, after which Professor Tichborne read a paper on "Some Recent Improvements in the Babcock Machine," and Mr. A. H. Allen a paper on "Vinegar: its Nature and Manufacture."

The following papers were taken as read: "Notes on Butter," by Mr. Otto Hehner; "A General Method for the Analyses of Oils and Fats," by Mr. H. Droop Richmond; "On the Detection of Heated Cotton-Seed Oil in Lard," by Mr. W. G. Crook; "Note on the Estimation of Chlorine in Certain Waters," by Mr. T. Fairley; "Some Simple Appliances for Measuring the Consistency of Semi-solids, with Note on a New Method of Butter Examination," by Mr. C. E. Sohn.

A vote of thanks to Sir Charles Cameron for presiding terminated the proceedings.

In the evening a banquet took place in the Shelbourne Hotel. Sir Charles Cameron presided. A special and attractive feature of the occasion was the presence of ladies.

Amongst those present were the Lord Mayor and Lady Mayoress, the Right Hon. Alderman Meade and Mrs. Meade, Sir Andrew Reed, C.B., Sir William Kaye, C.B., Sir Philip Smyly, Dr. Meldon, D.L., and Mrs. Meldon, Dr. and Mrs. Oulton,

Dr. and Mrs. Heuston, Mr. and Mrs. Otto Hehner, Mr. Allen, Dr. and Mrs. Charles Poll, Dr. Carte, Dr. and Mrs. Broomfield, Dr. and Mrs. Jacob, Dr. and Mrs. Teed, Dr. Arthur Benson, Dr. and Mrs. Harley, Dr. Magrath, Dr. and Mrs. Tichborne, Alderman Maguire, Rev. B. Gibson, Professor and Mrs. Lapper, Dr. and Mrs. Power O'Donoghue, Mr. Williams, Mr. Smith, Mr. Smetham, Mr. Jenkins, Mr. Baynes, Dr. and Miss Adams, Mr. and Mrs. A. O'Kennedy, Mr. J. MacAllan, Mr. Francis, Professor Roche, Mr. O'Meara, T.C., Dr. and Mrs. Alexander Smith, the Rev. Canon Bagot, Dr. Dyer, Dr. and Mrs. Knott, Mr. and Mrs. Farrell, Dr. Ormsby, Mr. Melfort D'Alton, Dr. and Mrs. Smyly, Mr. Coffey, Dr. Byrne, Mr. E. Douglas Cameron, Mr. E. Stewart Cameron, etc.

After dinner, the President proposed "The health of her Majesty the Queen and the Royal Family."

The toast was received with applause.

The President next proposed "The Corporation of Dublin." He said that at no previous period of its history did the Corporation of Dublin perform a more useful work to the citizens of Dublin than at present. In old times the chief business of the Corporation was to amuse themselves and spend the revenues of the city very much to their own advantage and to that of their friends; but in the present day the Corporation of Dublin was an eminently representative body—as, in fact, were most corporations in the United Kingdom—and they administered the affairs of this city with every desire to afford the greatest possible benefit to the citizens at large. The President, having spoken of his long connection as City Analyst with the Corporation of Dublin, proposed the health of that body, and coupled with the toast the name of the Lord Mayor.

The toast was drunk with applause.

The Lord Mayor, in responding, said that about fourteen or fifteen years ago they saddled themselves with a public analyst, and in doing so they had taken on their backs a veritable old man of the sea, for since that time peace and quietness and contentment had left the precincts of the Corporation. Acts of Parliament had been passed in abundance, and new taxes had been imposed on the city, and despite all that they had done fresh sacrifices were called for every year, and when Sir Charles Cameron laid down the law they had only to carry out his will, whatever it was, and it was a moot point whether it was wicked or benevolent (laughter). Science was said to have achieved great things, but the thing had gone far enough, and they should think of giving the citizens a rest, and not be too ready to increase the taxation of the city. Those, however, who remembered what the city was fourteen or fifteen years ago should recognise the progress and improvement made in this city, which in many respects supplied models and examples for the cities of the United Kingdom. Irishmen appeared to have been born for the express purpose of showing Englishmen and Scotchmen the way they ought to go (laughter). They all knew what a high opinion was entertained of Irishmen at the other side of the Channel; for not only were they going to allow Irishmen to manage their own affairs, but they desired to retain them at Westminster to see that English and Scotch affairs might be properly looked after (laughter).

The toast having been honoured, and an excellent vocal and instrumental duet having been given by Dr. and Mrs. Power O'Donoghue,

The Lord Mayor proposed "The Society of Public Analysts of Great Britain and Ireland," and coupled with it the name of Sir Charles Cameron, of whose services to the city as Public Analyst he spoke in commendation.

Sir Charles Cameron, in responding, said he felt flattered by the observations made by the head of the municipality in reference to the services which he had rendered to this city, of which he was proud to be a native born. It was a matter of pride to him that he had been elected President of the Society of Public Analysts, which included in its ranks the larger number of the most distinguished chemists in these countries. Its members were to be found all over the United Kingdom, in India, and in the Colonies. It was often said that if they wanted to know what was the opinion entertained of a man they should look for that opinion to the members of his own profession, and as an Irishman he was proud they had elected him as its president. He trusted that the members of the Society appreciated the reception accorded to them on the present occasion, and would be induced again to visit Dublin, a city which invariably accorded a friendly reception to the British Association and other distinguished bodies.

Sir Andrew Reed, C.B., in a happy and eloquent speech, proposed the toast of "The Ladies," which was duly honoured.

The Rev. Dr. Gibson and Dr. Smyly responded.

Alderman Meade, LL.D., proposed "The Health of the Officers and Council of the Society of Public Analysts," and coupled with the toast the names of Dr. Adams, Mr. Allen, Mr. Hehner, and Dr. Dyer.

The toast was honoured and responded to, and, with the toast of "The Press," the proceedings were brought to a close.

Dr. Smyly and other gentlemen made contributions to the pleasure of the evening by vocal and instrumental music.

NOTES ON (*a*) RICE-OIL; (*b*) MAIZE-OIL.

By Alfred Smetham, F.I.C.

(*Read at the Meeting, June 7th*, 1893.)

Some time ago a sample of rice-oil, obtained from Rangoon rice meal by means of hydraulic pressure in a clean press, came into my possession. The oil had a somewhat dirty-greenish colour, was semi-solid at the ordinary temperature, with white crystals giving it the appearance of the "figging" of soft-soap.

On examination, the oil, after filtering, yielded the following results:—

Iodine absorption	96·4%
KHO required for saponification	19·32%
= Saponification equivalent	290
Free fatty acids (KHO × 5)	64·0%

The proportion of free fatty acids in this oil being so high, I thought it desirable to ascertain whether the result was an exceptional one, or whether it fairly represented the character of the average rice meal imported. I therefore extracted, by means of ether, the oil from a number of samples of rice meal, which had been sent to me for analysis by different people, and after evaporating off the ether, the mixed oil was filtered through a dry filter in the water-oven at a temperature of 100° C.

On examination this oil yielded the following results :—

Iodine absorption	99·9%
KHO required for saponification	19·20%
= Saponification equivalent	292
Melting-point	29° C.
Free fatty acids (KHO × 5)...	77·20%

As this mixed oil showed a higher percentage of free fatty acids than the original pressed oil, I obtained a sample of recently-imported Rangoon rice, and separated, by hand picking, the husk from the clean seed. On analysis these gave :—

	Cleaned Rice.	Husk (Shudes).
Moisture (loss at 100° C) ...	12·65	9·70
Oil	2·20	1·16
Albuminoids (N × 6·25)	7·75	3·25
Starch and digestible carbohydrates	75·34	32·44
Cellulose	·66	39·90
*Ash...	1·40	13·55
	100·00	100·00
* Including SiO_2	·10	13·20

The free fatty acids in the oils extracted were :—

	Cleaned Rice.	Husk.
Free fatty acids	31·60%	34·00%

I then obtained what I believe to be the rice meal obtained from the rice I had previously examined, and analyzed it within a day or so of the time it was manufactured. I may here state that what is known as rice meal is the portion obtained by dressing the rice under emery runners, and does not, therefore, include the interior, or starchy portion of the seed.

This meal gave on analysis the following figures :—

Moisture (lost at 100° C.)	11·20
Oil	8·16
Albuminoids (N × 6·25)	12·50
Starch and digestible carbohydrates	57·83
Cellulose	4·46
*Ash	5·85
	100·00

* Including silica, 2·00.

From this meal a considerable quantity of oil was extracted in the manner before described, and on examination it yielded the following results :—

Iodine absorption	96·9%
KHO required for saponification	19·58%
= Saponification equivalent	287
Free fatty acids (KHO × 5)...	43·40

From these results it would be difficult to say whether the oil originally formed in the seed was a neutral one; but whether this is so or not, it is quite evident that the oil of rice meal, whether produced in England or imported as meal, contains a large percentage of free fatty acids. The percentage of free acid appears to be greater in the oil of the imported meal than that extracted from the seed by me, but whether this is due to the fact that decomposition takes place more rapidly in the meal than in the seed, or whether it is due to the fact that at Rangoon the rice is not dressed so perfectly as in England, I am unable to say; but I am strongly of opinion that it is chiefly brought about by differences in the processes of manufacture. The English meal, as a rule, contains from 8% to 9% of oil, while the Rangoon averages about 15%.

The following figures, obtained from four different samples, are in accordance with the preceding :—

	Rangoon Meal.	American.	Rangoon, (New Season). 1st Sample.	Rangoon, (New Season). 2nd Sample.
Percentage of oil in meal ...	15·46	11·03	15·86	15·36
Free fatty acids in oil ...	76·2%	52%	67·6%	50·6%

Maize-Oil.—At the latter end of last year an oil produced in the United States from maize was being offered to the soap-makers of this country. It was a bright, clear, yellowish oil, sweet to the taste and smell, and was offered at a price somewhat above cotton-seed oil. It was, however, sufficiently cheap to render it available as an adulterant of the dearer oils. The following figures may, therefore, prove of interest :—

Iodine absorption	116·3%
KHO required for saponification	19·88%
= Saponification equivalent	282

ON RAPID SAPONIFICATION FOR ANALYTICAL PURPOSES.

By Alfred Smetham, F.I.C.

Some time ago, while examining some mixed oils by the Kœttstorfer process, I was struck with the difficulty experienced in completely saponifying the whole of the vegetable oil present, and, in the presence of mineral oil, of ascertaining exactly when the reaction was complete. This led me to consider that the difficulty was caused by the insolubility of the oil in the alcohol, and the consequently limited surface exposed by it to the action of the potash; and that, if that were so, any menstruum in which the oil and alkali were both soluble would allow of very rapid saponification. Although I have not been able to devise such perfect conditions as these just formulated, I have, by the very simple method of adding a little ether to the fat

previous to the addition of the alcoholic potash arrived at practically the same result. The ether seems to act as a carrier, and saponification takes place very rapidly. The addition of ether also has the further advantage that in the presence of comparatively small quantities of mineral oil, not only is the animal or vegetable oil rapidly saponified, but a clear solution of the mineral oil is obtained, thus satisfying the operator that the mineral oil does not enclose any saponifiable matters—a point of no small satisfaction in the case of mixed oils.

Finding that in practice a considerable advantage was obtained by the addition of ether, I made a series of experiments to ascertain what conditions were the most favourable, and to what extent the process might be relied upon.

The saponification was conducted in flasks of about six ounces capacity, with glass tubes about three feet long, fitted by means of corks. After the addition of the alkali to the fat, the flask was placed upon a hole in a water-bath in which water was kept briskly boiling, and the flasks and contents were shaken at frequent intervals. The conditions of temperature, etc., were as nearly the same in all the experiments as possible. The alcoholic potash was approximately semi-normal.

The following are the results obtained, the percentages being calculated, for the sake of comparison, on the weight of saponifiable fat taken:

Fat taken.	Reagents used.	Time occupied. Minutes.	KHO consumed.
Tallow:			
(1) 3 grms.	30 c.c. KHO sol.	117	19·50%
(2) 3 grms.	30 c.c. KHO sol. + 10 c.c. ether	66	19·61%
(3) 3 grms.	30 c.c. KHO sol. + 20 c.c. ether	11	19·39%
(4) 3 grms.	30 c.c. KHO sol. + 30 c.c. ether	10	19·20%
(5) 3 grms.	30 c.c. KHO sol. + 40 c.c. ether	9	16·72%
(6) 2·5 grms. tallow ·540 kerosene	30 c.c. KHO sol. + 20 c.c. ether	25	19·56%
(7) 2·5 grms. tallow ·5 grms. paraffin wax	30 c.c. KHO sol. + 20 c.c. ether	50	19·52%
(8) 2·5 grms. tallow ·5 grms. paraffin wax	30 c.c. KHO sol. + 50 c.c. ether	16	19·12%
Colza-oil:			
(9) 3·241 grms.	30 c.c. KHO sol.	122	17·68%
(10) 3·545 grms.	30 c.c. KHO sol. + 20 c.c. ether	33	17·56%
(11) 3·676 grms.	30 c.c. KHO sol. + 40 c.c. ether	8	16·01%
Olive-oil:			
(12) 3·000 grms.	30 c.c. KHO sol.	102	19·20%
(13) 3·134 grms.	30 c.c. KHO sol. + 20 c.c. ether	15	19·36%
(14) 3·015 grms.	30 c.c. KHO sol. + 40 c.c. ether	15	18·92%

Fat taken.	Reagents used.	Time occupied. Minutes.	KHO consumed.
Coprah-oil:			
(15) 3 grms.	35 c.c. KHO sol.	35	25·88%
(16) 3 grms.	35 c.c. KHO sol. + 20 c.c. ether	15	25·92%
(17) 3 grms.	35 c.c. KHO sol. + 40 c.c. ether	15	25·94%
Raw Linseed-oil:			
(18) 3·028 grms.	30 c.c. KHO sol.	20	18·96%
(19) 3·023 grms.	30 c.c. KHO sol. + 20 c.c. ether	5	19·12%
(20) 3·027 grms.	30 c.c. KHO sol. + 40 c.c. ether	15	18·97%
(21) 3·003 grms. linseed ·6 mineral lubricating oil	30 c.c. KHO sol. + 20 c.c. ether	5	15·52%
(22) 3·019 linseed ·521 mineral lubricating oil	30 c.c. KHO sol. + 20 c.c. ether	15	19·00%
Refined Cottonseed-oil:			
(23) 2·947 grms.	30 c.c. KHO sol.	60	19·48%
(24) 3·148 grms.	30 c.c. KHO sol. + 20 c.c. ether	15	19·52%
(25) 3·221 grms.	30 c.c. KHO sol. + 40 c.c. ether	15	19·52%

In criticising the foregoing results, it should be kept in mind that in nearly all those instances in which the KHO consumed deviates from the correct amount to any appreciable extent, the test was purposely terminated in order to ascertain the least possible time in which saponification was complete, and these low results must not, therefore, be used to cast any reflection on the accuracy of the process.

The first test with each oil, in which only alcoholic potash was used, was continued until no more particles of oily matter could be detected with the eye, at which point saponification was judged to be complete. In no case, whether with or without ether, was any titration made while any oil was perceptible; and it will, therefore, be seen that not only must solution take place, but that time must be given to complete the reaction.

In experiment 7 the boiling was continued, to see whether the paraffin wax dissolved; but as the bulk of the ether boils off in the first fifteen or twenty minutes, no such solution took place.

In experiment 13 the liquid became clear in three minutes, in No. 22 in four minutes, and in 24 in seven minutes; but the digestion was continued in each instance for a quarter of an hour.

Judging from experience during the progress of these tests, it seems quite clear that no sufficient advantage is gained by increasing the quantity of ether beyond 20 c.c. In fact, a larger quantity seems to have a detrimental effect by lowering the boiling-point of the mixture. If, as I imagine, the ether simply acts as a carrier of the oil to the KHO, the longer time necessary for saponification in the presence of a larger quantity of ether is quite intelligible.

That heat is not necessary for complete saponification was shown by the fact

that, in the presence of 40 c.c. ether, 3 grammes of tallow was entirely decomposed on standing in the laboratory over night at the ordinary temperature.

In practice it would be a safe precaution to allow the greater part of the ether to evaporate before titration—although there is no need to do so if time be given for the completion of the reaction. The time occupied for 3 grammes of fat and 20 c.c. ether should in no instance be less than fifteen minutes; but if even double that time be allowed, a very marked advantage over the process as ordinarily worked will be obtained.

Discussion.

Mr. Alfred H. Allen congratulated Mr. Smetham on having initiated a number of very interesting experiments, and on arriving at results well worthy of the careful consideration of members of the society. Respecting the results obtained from rice-oil, it was a very curious but not sufficiently-explained fact that cereal oils often seemed to consist largely of free fatty acids. It was, at any rate, true of oat-oil, within his own experience, and it was now shown to be the case with rice-oil. He was very glad to see that the percentage of potash required for saponification was given. He protested against German chemists calling the quantity of potash required per thousand parts of oil the "saponification-equivalent." They were confusing terms, and when abstractors in this country translated foreign papers into English, the term "saponification-equivalent" was misapplied to such figures. There was only one correct way of using the term "saponification-equivalent," which should always signify the number of parts of the fatty material saponified by 56·1 parts of KHO or 40 parts of NaHO. With respect to the use of ether in the saponification experiments, it was disappointing to find that the author could not saponify completely in the presence of the larger amounts of ether. The figures he obtained were, of course, what might be expected. Anything which would shorten the labours of analysts, without affecting the accuracy of results, was to be welcomed, and he thought the society ought to feel indebted to Mr. Smetham for pointing out this method of securing a more perfect mixture, and therefore a more rapid saponification; but he could not help thinking that in a great many cases it was not worth while to make the addition, and if Mr. Smetham would only take the trouble to agitate the caustic potash with the fat, he would find a great increase in the rapidity of saponification. His (Mr. Allen's) experience was that fifteen minutes was amply sufficient to effect saponification in ordinary cases.

Mr. H. Droop Richmond asked Dr. Dyer if there was anything in the paper which gave a clue to the strength of the alcohol used. It would seem that the alcohol used must have been extremely weak if two hours were required for saponification. He had frequently performed the experiment in ten or fifteen minutes by heating in a flask attached to an upright condenser.

Mr. Blount felt convinced that it was a question of the strength of the alcohol used. He had frequently had occasion to saponify rape-oil, and he was sure that the saponification was quite complete in twenty minutes over the water-bath. He had used absolute alcohol, and frequently shook the flask.

Mr. Otto Hehner said that in his experience when the alcohol was sufficiently

light for the oil to sink in it, it was strong enough; but when the fat floated, then the experiment had better be recommenced. He believed that if Mr. Smetham had boiled the solution vigorously under a condenser the saponification would have been much more rapid. The most difficult body to saponify—ordinary wax—was completely saponified in an hour, provided the ebullition was violent. There seemed to be some advantage in using ether, but it had the disadvantage of lowering the temperature of the mixture. If a fatty body were saponified on the water-bath, then it appeared advisable to add a little ether. The figures of the other experiments which Mr. Smetham had brought forward under the headings of rice- and maize- oil were very valuable, and pointed out a very useful field of investigation, as maize-oil was now brought into commerce. He hoped that Mr. Smetham would tell them in a future paper something further about this substance. It was certainly a very interesting fact that these oils had so high an acidity. From what was known of the formation of oils, he was convinced that the oil, as formed in the plant or ultimately deposited in the animal, was always neutral. There were exceedingly few, if any, exceptions to this. One, which was considered an exception for many years—cod-liver-oil—had been shown not to be so. Some cod-liver-oils contained a very large percentage of acid, and a small percentage of fatty acids had always been found even in the freshest oil; but if the liver were taken out of the fish as soon as possible after it was killed, and the oil was pressed out at once, it was free from acidity; but if, on the other hand, the oil was allowed to remain in the liver for a day, it became acid. The acidity of cod-liver-oil was entirely due to the fishermen collecting livers some distance from the shore. As a considerable period elapsed before the seed to which Mr. Smetham had referred reached this country, naturally the amount of oxidation and decomposition in the seed was considerable.

GINGER: WITH SPECIAL REFERENCE TO DISCRIMINATION BETWEEN GENUINE AND "EXHAUSTED" SPECIMENS.

By Bernard Dyer, D.Sc., and J. F. H. Gilbard.

(*Read at the Meeting, June 7th,* 1893.)

It is well known that ginger which has been "exhausted" or "extracted" by mineral water manufacturers finds a ready market as an adulterant of genuine ground ginger, and that the detection of such adulteration is infrequent, although dealers in honest spices have long groaned under the unfair competition to which such adulteration subjects them. The word adulteration is used advisedly, because the case is precisely analogous to the admixture of skim milk with whole milk.

The chemistry of ginger has been laboriously worked out by Dr. Thresh, whose classical papers on the subject may be found in the back volumes of the *Pharmaceutical Journal.* In The Analyst only two papers have appeared on the subject of ginger, the first by Mr. E. W. T. Jones, in 1875, on "The Amount of Starch in Ground Ginger," the second by Mr. W. C. Young, in 1884, on "Some Analyses of Ginger." Mr. Young's opening paragraph runs thus:

"These analyses were made in the hope that some data would be found which would enable analysts to distinguish between genuine ground ginger and that to which exhausted ginger had been added. As will be seen by the results, my hope was not realized, the constitution of the samples being so widely different."

The points determined by Mr. Young were moisture, ash, ash soluble in water, "aqueous extract," "mucilage," "alcoholic extract," "resin" and cellulose. The method adopted for the determination of alcoholic extract was an arbitrary one, and the extraction may or may not have been complete. How "resin" was determined the author does not state. He does not seem to have realized the full value of the determination of *soluble ash*, which is, as we shall show, an item of valuable significance. Perhaps Mr. Young had not made sufficient comparative trials with exhausted ginger, or we cannot think he would have so despairingly dismissed the subject.

The question was some time back referred to one of us by Messrs. Joseph Travers and Sons, the well-known spice merchants and grinders, who were good enough to supply him with some typical specimens of genuine commercial ginger, and through whose help he was also able to obtain a number of samples of "exhausted ginger" (varieties unknown), *i.e.*, of ginger which had been utilized by makers of aërated waters.

The constituents, or groups of constituents, which it appeared to us desirable to determine were:

Moisture (loss at 100° C.)
Volatile essential oil.
Fixed ethereal extract.
Alcoholic extraction after ether extraction
Ash.
Ash soluble in water.

There is no satisfactory method of determining the volatile essential oil, although it is one of the most important constituents of ginger.

Dr. Thresh determines it by "drying" the ether extract at a low temperature and subsequently at a higher temperature, until it ceases to lose weight. The difference between the preliminary and the final "drying" he takes as volatile essential oil.

This is obviously a clumsy and unsatisfactory method, and we believed at one time that we had hit upon a better and a fairly quick and ready method of making, if not an accurate, at all events a comparative, determination of volatile oil. Our proposed method was to distil a small quantity (one to two grammes) of the powdered ginger with successively-added small quantities of water, collecting the distillates all together in one bottle. When the "oil" is all over, the contents of the bottle, well shaken up, exhibit a turbidity, and we hoped that the degree of turbidity would approximately measure the volatile oil. The first experiments made were promising enough and showed overwhelming differences in turbidity between the distillates from a genuine and from an exhausted sample; but in the further prosecution of our experiments the method broke down, for we found that, as perhaps might readily have been anticipated, the steam carried over not merely volatile oil, but fatty and resinous constituents of the ginger, so that the turbidity of the distillate was no real

measure of the amount of essential oil present. We therefore fell back on the simple, though somewhat lame, method of Dr. Thresh, merely placing the flasks containing the ethereal extract on a shelf above the water-oven until they lost only a few milligrammes weight per hour, and drying to final constancy in the water-oven itself.

Five grammes of the powdered ginger were taken for ethereal extract, the extraction being performed in a Soxhlet's apparatus. The ether extraction is often scarcely completed in one day, so it is desirable, after a few hours, to remove the flask with the first portion of the extract, and proceed to dry it as above described; then to substitute a second flask and continue the extraction for a second day, adding the residue thus obtained to the first residue.

Absolute alcohol was then substituted for the ether in the Soxhlet apparatus, and the alcoholic extract determined. Complete alcoholic extraction generally requires two days.

The ash was determined in five grammes and washed with hot water. The insoluble matter was weighed, digested in acid, and the siliceous matter determined.

The following are our results:

Unexhausted Gingers.	Moisture. Loss at 100° C.	(Approximate) volatile essential oil.	Fixed ethereal extract.	Alcoholic extract after ether extraction.	Total ash, less sand.	Ash soluble in water.	Ash insoluble in water, less sand.
Best Jamaica	13·6	0·7	3·0	3·1	3·1	2·4	0·7
Jamaica	13·4	1·2	3·9	3·8	3·9	3·0	0·9
Cochin	12·9	1·2	4·7	3·1	3·6	2·3	1·3
"Original" African	14·4	2·9	6·4	2·7	4·0	2·4	0·6
Washed African	14·1	2·5	7·0	2·1	4·1	1·9	2·2
"Original" Bengal	14·6	1·5	4·5	2·1	3·9	2·6	1·3
Exhausted Gingers. (Varieties unknown.)							
A	12·1	0·8	5·2	1·2	2·1	0·4	1·7
B	11·8	0·5	3·0	1·2	1·2	0·3	0·9
C	11·8	0·4	4·7	1·4	2·3	0·4	1·9
D	11·7	0·9	4·9	1·5	2·2	0·5	1·7
E	11·9	0·5	3·0	0·8	1·1	0·2	0·9
F	11·5	0·7	4·1	1·1	1·9	0·3	1·6

The percentage of siliceous matter varied from 0·2 to 1·5 in the genuine samples, and from 0·3 to 0·4 in the exhausted ones.

The "volatile oil" is obviously too variable to be taken as a basis for the quantitative estimation of admixture in adulterated samples, though it may, in conjunction with other features, have some significance. The "fixed ethereal extract" has little if any value, owing to its variability in genuine ginger.

The extract obtained by alcohol *after complete removal of the ethereal extract*, appears, however, to be a valuable item to the analyst. In the genuine gingers it ranges from 2·1 to 3·8 per cent., with an average of 2·8 per cent. In the "exhausted samples" it ranges from 0·8 to 1·4 per cent., with an average of 1·2 per cent.

The total ash in the genuine gingers (excluding sand) ranges from 3·1 to 4·1 per

cent. In the "exhausted" samples it ranges from 1·1 to 2·3 per cent., averaging 1·8 per cent.

The *ash soluble in water* ranges in the genuine gingers from 1·9 to 3 per cent., averaging 2·7 per cent. (Mr. Young in seven authenticated samples found the soluble ash to range from 1·8 to 2·6 per cent.).

In the "exhausted" samples the soluble ash ranges from 0·2 to 0·5, averaging 0·35 per cent.

While it appears to be unfortunately true that some samples of genuine ginger may be mixed with a considerable quantity of exhausted ginger without affording conclusive analytical evidence of the fact, it is at the same time, we venture to think, obvious that in a great many cases the addition may be detected, and that at all events much of the flagrant adulteration of ground ginger which is commonly believed to exist might be prevented by analytical vigilance.

Discussion.

Mr. Hehner said that it was important that analysts should be able to deal with an article which was so notoriously adulterated as ginger. To his knowledge a very large bulk of spent ginger which was used for trade purposes was re-mixed and sold to the unwary as whole ginger.

Mr. E. J. Bevan asked the authors of the paper how they accounted for the ash soluble in water, and the total ash being so much reduced. Was it the case that the ginger was first extracted with alcohol? If the ash was determined after the extraction with alcohol, it ought to be considerably higher.

Dr. Dyer replied that it was weak alcohol which dissolved out the ash. Strong alcohol did not diminish the ash. Weak alcohol was used in making extracts, because in that case a finer flavour was obtained, objectionable resins being excluded.

Mr. Budden asked Dr. Dyer if he knew that it was a fact that in the trade a great number of different methods of extraction were employed. In the case of ginger wine made from raisin wine, etc., the ginger was bought in the condition of root, roughly crushed and then "steeped," as it was termed in the trade, for a long time in a liquor containing 25 per cent. of proof spirit. Only the more delicate flavoured matter was abstracted by that means, and the extracted or "spent" ginger was then sold for the purpose of adulterating ginger and spices, and a certain proportion of it found its way to the lower classes of gingerbeer makers. It had a distinct value as a flavouring material. Probably the whole of the volatile oil had been extracted, but all the pungent resinous matters were left behind. He further wished to ask whether the authors of the paper had made any experiments on the solubility in pure water, without the addition of spirit. He believed he was right in stating that the most valued flavouring matters of ginger were really capable of being extracted by water, and that the method which was adopted by the manufacturing chemist, who specially prepared ginger for the manufacture of aerated beverages, was first of all to extract the ginger fully with very strong alcohol, and subsequently to precipitate the whole of the resinous matter. After evaporation in vacuo, a residuum was obtained which was practically soluble in water, without any

further precipitation of resinous matters. In support of the view that the real flavouring principle of the ginger root was soluble in water, it might also be stated that occasionally ginger comes into the market which has been deprived of a small percentage only of its flavour by boiling with water. Subsequent drying leaves this product very much in the condition of an inferior genuine ginger, but if it be not sold as " spent ginger " the fraud is obvious.

Mr. Sidney Harvey said that it was very important to manufacturers of some of the many aerated ginger-beers prepared, not by fermentation, but by charging with carbonic acid gas a solution of sugar, and acid, and ginger extract, to avoid anything like turbidity, and the first aim of makers was to obtain ginger as perfectly free from the resinous matter as possible, so that the resin was got rid of first, and, as Mr. Budden had said, the delicate flavour of the ginger was really in aqueous solution, and was prepared in a very strong form for that purpose.

Mr. Budden said that he knew of an actual case where ginger, which had been thoroughly extracted with strong spirit, and which was merely a mass of cellulose, fibre, and starchy matter, with no resin left, and practically tasteless, was used for adulterating purposes, to his certain knowledge.

NOTE ON CENTRIFUGAL MILK-TESTERS.

A Contribution to the Discussion on Mr. Embrey's Paper. (*See* The Analyst, May, 1893.)

By Dr. P. Vieth.

Of all the methods which have been suggested and introduced for determining fat in milk outside the chemical laboratory, and by persons who are not trained chemists, those are now reigning supreme which are based upon the principle of decomposing the milk proteids by the action of an acid, submitting the mixture to centrifugal force, and measuring the volume of the separated fat. It is well known that the first apparatus—and for a number of years the only one—in which this principle was put into practical shape was the Lactocrite. The correctness of the results obtained by its use was fully acknowledged, but the price of the machine and the skill necessary for working it prevented its more general application. Since the last three years a number of other machines based on the same principle have been introduced, and the attention which they—or, at least, some of them—have received is shown by Mr. Embrey's paper, read before the Society of Public Analysts at the April meeting, and the discussion by which it was followed.

I must admit that, when I first read and heard about the Babcock process, I had grave doubts whether, by treating milk with an equal volume of concentrated sulphuric acid, the fat would not be attacked as well as the proteids and sugar. Experience has since shown me that this is not the case—at any rate, not to such an extent as to interfere appreciably with the results.

The first original Babcock apparatus which came over to Germany appears to have been rather a shaky machine; in a competition of milk-testers it was condemned. A second machine was imported last year, and exhibited at a dairy show at Rostock. It did not give the impression of being of sufficiently strong construction, but served as the model for constructing stronger machines. When one of the new machines was tested at the Agricultural Experimental Station of Rostock, Professor Heinrich, the principal of that station, in a long series of comparative experiments, found that the results obtained by the Babcock method were on average ·22 lower than the results arrived at by gravimetric method of analysis. The Babcock made 800 revolutions per minute. Professor Heinrich then combined the Babcock tester with the driving-gear of the Lactocrite, and thereby was able to give the machine a speed of 1,500 revolutions per minute; the results now agreed with the gravimetric analysis within ·03 on average. In order to reach this higher speed the machine had again to be reconstructed, by fitting to it a much larger driving-wheel, and giving it a stronger and heavier stand.

After having used this improved machine for some time, I can testify that it is now a very useful apparatus, worked with the greatest ease and without any difficulty, and giving very satisfactory results. Comparing the Babcock with the Leffmann-Beam apparatus, I found a very satisfactory agreement. I give the results of one series of experiments as an example:

Babcock	3·0	3·2	3·35	3·35	3·2	3·7	3·0
Leffmann-Beam ...	3·1	3·2	3·4	3·4	3·2	3·7	3·0

I have used the Leffmann-Beam apparatus regularly for six months, and like it very much indeed. It is an elegant little machine, which in my hands has always worked without the slightest hitch. Although two samples only can be treated at the time, I have found it possible to complete in a given time as many examinations as with a Babcock apparatus fitted with ten test-bottles.

Discussion.

Mr. Cassal said it appeared to him that Dr. Vieth held the same view which he (Mr. Cassal) had taken when Mr. Embrey read his paper on the Lister-Babcock process—namely, that however ingenious the Lister-Babcock process might be, it ought not to be recommended for the use of persons who had had no scientific training whatever, and who were not capable therefore of drawing correct conclusions from the results observed. Unfortunately, it happened that in the number of The Analyst in which the paper and discussion appeared the report of the remarks which he (Mr. Cassal) had made was such as to make it appear that he entertained a high opinion of this machine and of the process. There was nothing in the report of those remarks, as printed, to show the opinion—which he certainly held very strongly—that this apparatus could only be used properly by trained persons. It happened that his remarks, as printed in The Analyst, merely referred to some experiments that he had made with a view of testing centrifugal machines for separating mixtures of liquids. In view of this fact, he now took the opportunity of again expressing his

opinion that the machine, and the process, ought only to be placed in the hands of trained persons. On the occasion referred to he had forgotten to mention an observation which he had made in working the Leffmann-Beam process—a process which he fully agreed in thinking was a very good one in skilled hands—namely, that while in the great majority of cases the process worked quite satisfactorily, occasionally a result was obtained which was entirely wrong. That might be due to an error in the making of the mixture, or it might be due to insufficient rotation, or to other circumstances which he had not investigated, but the fact remained that he had noticed that inaccurate results were sometimes obtained. This was in itself enough to show that processes of the kind should not be recommended for the use of people who could not really judge analytical results. He took the opportunity of recording a protest against the position that was taken up by the reader of the paper upon that occasion, and by some of the speakers; for the absence of such a protest from the report of the proceedings amounted to committing the Society of Public Analysts, and public analysts generally, to a recommendation of the process for use by untrained and unskilled persons. He also felt bound to express his deep regret that, in consequence of what took place on the occasion referred to, it might be supposed by persons who did not know the Society that it had been made use of to advertise the Lister-Babcock machine and process for the purposes named, a sort of proceeding to which, of course, the Society of Public Analysts should never, and would never, consciously lend itself.

Mr. Richmond said that Mr. Cassal informed the Society that although the results of experiments made by centrifugal machines were, as a rule, accurate, it sometimes occurred that one case was not accurate. He would like a little more information as to the latter point. Was it a considerable amount above or below the fat estimated gravimetrically, or was it that the fat could not be obtained in proper condition for reading?

Mr. Cassal replied that in some cases the amount of fat was entirely out. He was speaking from memory, but he thought sometimes as much as 0·5 per cent. out as compared with a calculated result or with the accurate determination of the fat by the Werner-Schmid or by the Adams method. So far as he could recollect, he had obtained, perhaps, some half a dozen cases of the sort while using the Leffmann-Beam process. He did not say that this was the fault of the process; it merely served to show that errors would occur, and that it would not of necessity yield accurate results automatically and invariably.

Mr. Richmond believed that there must be something in Mr. Cassal's mode of working which was not in accord with his (Mr. Richmond's) mode of working. He had checked his results by the Adams and Werner-Schmid processes, and had also checked them by the calculation method, yet he did not find that the results differed. On one occasion he had found—when using a new bottle of acid which was stronger than usual—that the fat did not separate so well, there being a considerable number of dark particles in it; but on slightly diluting the acid this difficulty disappeared. The results obtained had been so good of late that he placed absolute confidence in the method, and he would almost as soon trust to it as to the Adams method.

On the Recognition of Mixtures of Butter and Margarine, or of Butter with other Fats, whether Vegetable or Animal. A. M. Houzeau. (*L'Industrie Laitière*, 1893, 19, 147.)—If equal weights of butter and margarine are dissolved in equal volumes of alcohol of constant strength, at a known temperature, the point at which turbidity is apparent in these solutions varies with the temperature, in proportion as these fats are more or less soluble; the temperature observed at the moment when the turbidity of the alcoholic liquor is sufficiently pronounced serves to show the relative solubility of these fats comparatively.

In order to determine the point of turbidity with exactitude, the solutions are cooled in a flat-bottomed flask, on a point in which a spot the size of a wafer is made with Sabatier's ink. The same weights of butter or margarine are always used. The temperature is taken at the moment when the white spot becomes invisible. Two experiments on the same butter can be read within 0·1° or 0·2°. A difficulty arises since the degree varies in pure butters; and butters prepared at an interval of a few weeks, or even from 10 to 15 days, from the milk of the same cow show differences. This difficulty is due to the larger or smaller proportion of soluble glycerides which are present. Hence purification is necessary to secure the same degree in all butters. This purification is easily effected by dissolving in a constant amount of alcohol, warming to a temperature at which the fat dissolves, and then cooling in a bath at a constant lower temperature. The deposited matter is separated by filtration, the funnel and receiver being also in the bath. The less soluble glycerides are deposited.

When the alcohol is driven off this residue should be treated as before. The results after this purification are of a much more constant nature.

Pure butter fat before purification	63·0°
Same butter fat with 16 per cent. margarine...	68·0°
,, ,, 12 ,, ,, ...	66·5°
,, ,, 8 ,, ,, ...	65·5°
,, ,, 8 ,, oil	65·4°

	Before Purification.	After Purification.
Pure butter fat	59·0° ...	60·0°
Another butter fat	61·0° ...	60·0°
,, ,, ...	64·2° ...	60·0°
,, ,, ...	67·5° ...	60·2°

A second purification in the same manner as the former, but at a different temperature, produces quite constant results:

	Original.	First Purification.	Second Purification.
First pure butter	59·0° ...	60·0° ...	42·0°
Second ,, ...	64·2° ...	60·0° ...	42·0°
Third ,, ...	67·0° ...	62·3° ...	42·0°

The delicacy of the method is seen from the following figures:

	First Purification.
Pure butter	60·0°
,, with 6 per cent. margarine	60·9°
Second pure butter	60·0°
,, ,, with 8 per cent. margarine ...	62·6°
Third pure butter	60·2°
,, ,, with 8 per cent. cocoanut-oil	59·0°

	Second Purification.
Pure butter	42·0°
,, with 6 per cent. margarine	43·0°
,, with 8 per cent. cocoanut-oil	41·0°

The amount of volatile fatty acids purified in this manner is constant.

A mixture of margarine and cocoanut-oil could be made to evade the turbidity test, but would immediately be recognised by a determination of the volatile fatty acids.

Example.	Degree of Turbidity.	Volatile Acids.
Pure butter	42·0° ...	18·3 c.c.
,, with a mixture of margarine and cocoanut-oil 10 per cent. ...	42·1° ...	16·7 c.c.

In this paper the author does not give details, but promises to fully describe his method in a further communication as to quantities taken, etc., at an early date.

L. K. B.

The Application of Sodium Peroxide to Analysis. W. Hempel. (*Zeit. Anorg. Chem.*, iii. 193, 194.)—Commercial sodium peroxide is free from sulphur and practically free from chlorine; it contains 60 to 70 per cent. of Na_2O_2, the rest being sodium oxide. In the rapidity with which it effects oxidation at a red heat it far surpasses all other oxidizing agents, and loss during the operation is reduced to a minimum. The recognition of chromium and manganese by heating the suspected substance with about twice its weight of the peroxide is a matter of seconds, and the opening up of tungsten minerals with this reagent is exceedingly easy; thus, when 1 part of wolfram is melted with 4 parts of sodium peroxide, all the tungsten is converted into sodium tungstate in a few minutes. Equally expeditious is the decomposition of titanic iron by melting one part of the finely powdered ore with 4 parts of sodium peroxide; the melt is dissolved in hot water, the ferric hydroxide filtered off, the solution mixed with strong sulphuric acid, evaporated until part of the acid has been expelled, and when cold poured into a large quantity of cold water. Filtration, if not clear, and precipitation of the titanic acid from the boiling solution with sulphurous acid, conclude the operations.

For attacking sulphides the peroxide must be diluted, as the action is otherwise too violent. One part of the substance, 2 parts of soda and 4 parts of sodium peroxide are heated together in a silver crucible for a few minutes. The mass is dissolved in water, ferric oxide is filtered off, and the sulphuric acid in the filtrate precipitated with barium chloride after acidification. Lead and zinc go into the aqueous solution, so that this is at the same time an easy way of separating the iron in galenas and blendes. The following results are cited:

	By Aqua Regia.	By Fusion with Sodium Peroxide.
Sulphur in blende, per cent.	26·46 ...	26·53
,, pyrites ,, ...	36·05 ...	36·07

A. G. B.

The Solubility of Rosin Oil and Mineral Oils and Mixtures thereof in Acetone. F. Wiederhold. (*J. Prakt. Chem.*, 1893 [2], xlvii. 394-397.)—Rosin-oil dissolves in acetone in nearly all proportions, but mineral oils are either sparingly or not at all soluble therein. Six different samples of rosin-oil were investigated in this respect, and it was found that all of them dissolved to a clear solution at 15° C. in half their volume of acetone. It is of importance that the acetone be dry and free from acid; the presence of aldehyde may be allowed. In order to keep the solvent dry, it must be exposed to the air as little as possible to avoid the condensation of moisture, which always occurs in vessels containing such volatile solvents, by the lowering of the temperature below the dew-point, owing to the latent heat of vaporization of the liquid. The difference between the solubility of rosin-oil in moist acetone and in dry acetone is very considerable, so much so, indeed, that this forms a rapid test for moisture in the solvent.

Russian mineral oils require very varying quantities of acetone for their solution, and the amounts are apparently relative to the specific gravities of the oils. Thus, for perfect solution at 15°:

One volume of	Sp. Gr.	Requires of Acetone.
Burning oil	0·830	4 vols.
Russian spindle oil ...	0·898	40—41 ,,
Oleonaphtha	0·908	70—71 ,,

But, as might be expected, considering that the commercial mineral oils are of varying composition, the quantity of acetone necessary varies between considerable limits.

As a means of identification, the solubility may be applied by shaking 2 c.c. of the sample with 20 c.c. of acetone in a mixing cylinder, graduated to $\frac{1}{10}$ c.c., and reading the portion left undissolved after 12-24 hours. In this way the following figures were obtained:

	Sp. Gr.	Left undissolved at 15° C.
1. Russian cylinder oil (Nobel)	0·913	1·7 c.c.
2. Russian "Distillate" (Nobel)	0·910	1·5 ,,
3. Mineral oil, No. 1. (Schibaeff)	0·908	1·5 ,,
4. Caucasine 1 (Nobel)	0·808	1·5 ,,
5. Oleonaphtha A.A. (W. Schliemann)... ...	0·905	1·5 ,,
6. Bakunit (Deneys and Co.)	0·905	1·5 ,,
7. Russian spindle oil (Nobel)	0·898	1·3 ,,
8. Pale machinery oil (Thompson and Bedford)	0·905	1·1 ,,
9. Extra spindle oil (Thompson and Bedford) .	0·885	0·8 ,,

The American cylinder oils are almost entirely insoluble in acetone.

Viscid and dark, unrefined oils must be treated at a higher temperature, for which purpose the mixing cylinder may be heated in boiling water; the figures thus obtained cannot of course be compared with those obtained at 15° C.

Care must be taken that the oil tested is not acid. Referring to the detection of acidity in an oil, the author points out that the test originally devised by him remains the best. The oil is shaken with cuprous oxide (not cupric oxide, as stated in the text-books), which will form a copper soap, with separation of metallic

copper, if free acid be present; this soap will dissolve in the oil and colour it green, but judgment must not be passed until after the lapse of twelve hours.

The solubility in acetone will serve for the detection of rosin-oil in a mineral oil. As is well known, this sophistication may be effected by mixing the rosin-oil with a mineral oil of lower specific gravity than that stipulated in the specification, for the specific gravity is raised by the rosin-oil. As an example, the author quotes the case of an "oleonaphtha" which fulfilled the specified specific gravity of 0·906 - 0·908, but consisted of a Russian spindle oil, to which had been added one-sixth of its weight of red rosin-oil; this sample left only 1 c.c. undissolved when 2 c.c. were shaken with 20 c.c. of acetone, as above described, whereas a normal oleonaphtha should leave ·15 c.c. undissolved.

Finkener suggested that a mixture of 10 volumes of alcohol (sp. gr. 0·818) and 1 volume of chloroform should be used for detecting rosin-oil in mineral oils, in the proportion of 10 volumes of the mixture to 1 volume of oil at 23° C., its application being similar to that suggested above. The necessity for a temperature of 23° renders this proposal impracticable as it stands; but the author finds that it will answer at 15° if 16 volumes of the alcohol-chloroform mixture be substituted for 10 volumes.

A. G. B.

[The author appears to be ignorant of the fact that Demski and Morawski have suggested the use of acetone for detecting rosin-oil in mineral oils. Compare Allen's "Commercial Organic Analysis," ii. 466.—A. G. B.]

REVIEW.

Gli Olii (Oils). By G. de Negri and G. Fabris. Publication of the Laboratorio Centrale delle Gabelle, Rome.

Part I. Sulle reazioni che caratterizzano l'olio di oliva. (On the reactions that characterize olive-oil.) 1891.

Part II. Sulle reazioni che caratterizzano alcuni olii di semi. (On the reactions that characterize some seed-oils.) 1893.

The work, which emanates from the Laboratorio delle Gabelle—the Somerset House of Italy—contains nearly all that is known about the oils treated of. The authors have determined the density, freezing-point, melting and solidifying points of the fatty acids, rise of temperature with sulphuric acid, iodine absorption and potash absorption, and they have also examined the various colour and other reactions for specific oils. The results obtained are classified under the various oils, and a *résumé* is given of the work of other observers. Typographical errors occur in a few instances, the most objectionable being the substitution of 6 for 9 in several places.

The authors adopt Jean's thermo-oleometer for the determination of the rise of temperature with sulphuric acid. This is a great advance, as there can be no doubt as to the meaning of this determination; it would be a great boon if this method or that of Thompson and Ballantyne were officially adopted. We are glad to see that the authors have definitely disproved that the presence of sulphur is characteristic of

oils derived from the *Cruciferæ;* they also show that the oils of bitter almonds, apricot, peach, and cherry do not contain prussic acid if obtained by cold pressure, while if these oils are extracted by solvents this acid occurs. They have studied Rénard's method for the detection of earth-nut-oil; they modify it somewhat as follows: The washing with ether of the lead salts is done as far as possible in the beaker in which they were precipitated, and finally they are collected on a filter; the filter is placed in a separating funnel, at the bottom of which is a small wad of glass-wool to stop the filter-paper from running through; dilute hydrochloric acid and ether are added; after the lead-salt is decomposed, and the fatty acids dissolved in the ether, the aqueous portion is first run off, and then the ethereal solution collected in a beaker, the ether evaporated, and the fatty acids dissolved in alcohol as usual. The quantity of arachidic acid found in earth-nut-oil was from 4·4 to 4·8 per cent., and the authors were able to estimate 10 per cent. of earth-nut-oil in olive-oil, working at 15° C.; with smaller quantities the results were not reliable.

A study of the little-known oil of coffee was made. Maize-oil was also examined.

We can recommend this work not only as a book to be read, but also as a good work of reference. We congratulate the authors on having produced a work of such value.

H. D. R.

IMPORTANT APPEAL CASE.

Is Coloured Acetic Acid Vinegar?

(From the *Birmingham Post.*)

At the Birmingham Quarter Sessions on Monday, July 3, before the Recorder, Mr. J. S. Dugdale, Q.C., William Kirby, 69, Digbeth, appealed against a conviction made by Messrs. W. N. Fisher and H. P. Ryland, Justices of the Peace for the city, on May 19, for an alleged offence under the Food and Drugs Act. Mr. T. Terrell (London) and Mr. Foster (instructed by Jaques and Sons) appeared for the appellant, and Mr. Hugo Young and Mr. Symonds (instructed by Mr. Bell from the Town Clerk's office) for the respondents.

Mr. Hugo Young, in opening the case for the respondents, said the appeal was against a conviction by the Birmingham magistrates, under Section 6 of the Food and Drugs Act, 1875. He said that on April 13 Inspector Davis, in pursuance of his ordinary duties, went to appellant's shop and demanded half a pint of vinegar, for which he paid one penny, the price of best vinegar. After the purchase Davis observed the particulars required by the Act before the vinegar was submitted for analysis. The Public Analyst reported that the liquid contained 70 per cent. of pyroligneous acid, and consequently proceedings were taken. The question arose in that case What was properly sold under the designation of vinegar? In order to go back to the commencement he thought it was obvious to everybody that the term vinegar was derived from *vin aigre*, the French for sour wine. He believed that wine allowed to go sour under atmospheric conditions would produce vinegar, and no doubt that was the origin of vinegar known at the earliest time. In producing vinegar they must have first of all alcohol which was converted by atmospheric oxygen by the process called acetous fermentation into acetic acid. In the course of the production of that acetic acid, the various properties of the wine remained, along with the acetic acid which was produced by the conversion of the alcohol, and therefore what they had to see was what vinegar consisted of. He thought it was right, from their point of view, it should consist of dilute acetic acid, plus the other properties of the wine. They defined vinegar as a liquid consisting essentially of impure dilute acetic acid obtained by the oxygenation of an alcoholic liquid. The real point was whether, without that alcohol as the basis—without which they did not get the other properties of vinegar—it was right to call the liquid vinegar. It had been said that these prosecutions, if upheld, would interfere with a large industry, but there was no desire to interfere with the sale of acetic acid

made from the distillation of wood. If this liquid served the purposes of vinegar then the public would buy it, and there would be no reason for selling it as vinegar. At present it was sold under a designation it did not properly bear, and the only object could be to mislead the public. If in the appellant's case the liquid sold was better than vinegar, why not sell it under its distinctive term, and let the people know what they were buying?

Thomas Davis, Inspector under the Food and Drugs Act, deposed to purchasing the vinegar from Mrs. Kirby. He informed Mrs. Kirby that the liquid was for analysis, and she then said that it was not malt liquor. She also replied that she did not mind, as she had had a letter from the firm that supplied it, saying they would be responsible for any proceedings which might be taken against her husband for selling it.—Cross-examined: He went to appellant's shop on his own account. He had previously noticed that there had been prosecutions in different parts of the country, and was aware the question had been raised as between vinegar and malt vinegar. He did not ask for malt vinegar purposely. He was unaware that there were in the trade distinctions between vinegar and malt vinegar.

Dr. Alfred Hill, Medical Officer of Health and Public Analyst, gave a description of his analysis and the composition of the liquid submitted to him. True vinegar, he said, was made from the juices of plants, fruits, sap, or any material extracted by water. Pure acetic acid could be produced in a cheaper form than by getting it from alcohol. The common source of obtaining acetic acid for commercial purposes was from wood.—Cross-examined: Malt converted into alcohol, then acetified, and then distilled, was in his opinion distilled vinegar. It was not vinegar in the ordinary sense.—Mr. Terrell: Do you know that persons who produce vinegar in that way are called vinegar makers by Act of Parliament?—Witness: Distilled vinegar makers.—Mr. Terrell: No, vinegar makers.—Witness: I should apply the qualifying adjective.—In answer to further questions, witness said that he did not know of any vinegar maker who sold vinegar uncoloured. He believed so-called malt vinegars were coloured with caramel.—Mr. Terrell: Do you think that adulteration?—Witness: I don't call it adulteration; I think it is done simply to pander to a vitiated public taste.—You are going to put that vitiated taste right? I leave that to you.—He did not think that pure vinegar made from malt was unsuitable for the manufacture of pickles, and he did not know that such vinegar was dosed with sulphuric acid to prevent it going musty. The so-called vinegar made from wood was not so liable to go musty. Witness had certified that the vinegar sold to Davis contained 70 per cent. of pyroligneous acid, but it really contained more. He had given the vendor the benefit of every weak point.—Mr. Terrell: Was not the real reason you certified the 70 per cent. that you did not analyze the vinegar at all?—Witness: That's an insult, and I decline to answer.—Mr. Terrell: Was not the real reason that you only distilled off the acetic acid and weighed the residue?—Witness: I decline to answer the question. I don't come here to be insulted.—Mr. Terrell: I am not insulting you.—Witness: Then your code of morals is different to mine.—The Recorder pointed out to the witness that counsel was asking him how he conducted the analysis, and witness replied that he would answer if counsel were courteous.—Mr. Terrell: Did you do anything more than distil off the acetic acid?—Witness: You know I did. I will repeat it for you, since your memory is so short. Witness detailed the method of his analysis.

Mr. Terrell admitted that the liquid in dispute was made from wood, and the question was whether it came under the term "vinegar" or not.

Mr. Otto Hehner, Mr. Jones (Wolverhampton), and Mr. A. H. Allen (Sheffield and London) gave evidence, and agreed that the liquid in question could not properly be called vinegar.—In cross examination. Mr. Allen said that as a food there was little difference between the malt vinegar and the liquid in question, but as a stimulant to latent digestion there was a difference. Several grocers and drysalters also gave evidence, and said that when they were asked for vinegar they supplied malt vinegar.—William Singleton, formerly a maker of pyroligneous acid, said that he believed the difference in cost of making acetic acid as distinguished from malt vinegar was between 1½d. and 6d. per gallon.

For the appellant, Mr. Terrell said that the case was one of great importance, because that was the only tribunal before which that matter could be brought as a matter of final appeal. He took it that it must be a question of fact whether that was vinegar or not, and therefore one upon which it would be difficult, at any rate, to state a case. The trade which was attacked had grown for at least seventy or eighty years, and during that time a great industry had been developed in manufacturing acetic acid from wood for the purpose of vinegar making. Extensive works had been constructed in South Wales and elsewhere, and an enormous amount of capital had been invested in these works. Up to about three months ago the trade had remained absolutely unchallenged. The question to be determined was really what was the scope of the word "vinegar." He was going to suggest, and asked the Court to find, that any

potable form of acetic acid might be defined as vinegar. That there were several different forms of acetic acid there could be no question. Step by step science had progressed, and new discoveries had been made, among them being that of the making of vinegar from the destructive distillation of wood. This industry had grown up under the eyes of the law, and had been openly conducted for many years. He should call evidence to show that the liquid in question was absolutely better than vinegar made only from malt or malted grain.

Professor Attfield, F.R.S., of Watford, and 17, Bloomsbury Square, London, editor of the *British Pharmacopœia*, said that in his opinion there was no one fluid that could claim the word "vinegar" for a name. Vinegar belonged to a class, and was a generic term. He was familiar with vinegar made from wood, and when that substance was properly prepared it could legitimately be called vinegar. He was acquainted with the manufacture of vinegar, and was consulted by various vinegar manufacturers. To his knowledge there was no so-called malt vinegar properly made now. He looked upon the term "malt vinegar" at the present time as a misnomer, and he should call malt vinegar vinegar made from malted grain alone. The malt vinegar commonly so called was not, strictly speaking, malt vinegar. With regard to the substance in dispute, he had known of it for nearly forty years, and considered it came under the generic term of vinegar. It was not fair to call it pyroligneous acid. He considered the dietetic value between malt vinegar and the liquid in dispute was absolutely insignificant. There was nothing injurious to health in the substance, as far as he was aware; it fulfilled all the uses of vinegar.—Cross-examined: He could not give an exhaustive, inclusive and exclusive definition of vinegar. His definition was acetic acid and water sufficient to make it potable.

Dr. Suckling said that he had heard the evidence of Professor Attfield and generally agreed with it.

Mr. H. Grimshaw, Manchester, and Mr. F. Sutton, Yarmouth, also gave evidence.

Mr. J. Taylor, of Torquay, said that dilute acetic acid had been sold as vinegar for very many years. It was very pure, and was superior to malt vinegar by reason of its containing neither sediment nor vegetable matter, the latter being liable to putrefaction. By Mr. Young: He preferred the acetic acid coloured to the malt trade vinegar, and thought that the term vinegar was justly applied to it. By the Recorder: He had heard of champagne being made in England. If it were not made from the grape he should not call it champagne. Mr. Henry Evans, Inland Revenue officer, stated that the Somerset House authorities recognised pyroligneous acid as vinegar, and compelled all manufacturers of it to hold licenses.

Mr. B. Biggs, of London, drysalter, stated that since the beginning of this century vinegar had been made from acetate of soda. To his mind any acid with a pleasant flavour would be vinegar. The Recorder: Is it the flavour, then, that makes the vinegar? Witness: It depends upon the person's taste. In reply to further questions, the witness said that in preparing red herrings and hams pyroligneous acid was used.

Mr. Woolway, of the City Vinegar Company, Bristol, said that he had made vinegar from pyroligneous acid, and took five prizes with it at the Paris Exhibition. By Mr. Young: Witness in reality was the appellant in this case. Probably the public would not buy the diluted acetic acid so readily if they knew what it was.

Evidence as to the long-continued practice of selling the substance in question as vinegar was given by Mr. Robert Hemming, of Summer Lane, and Mr. S. Main, of Bromsgrove Street, grocers, the witnesses stating that it had always given satisfaction to their customers.

Mr. Terrell, summing up the appellants' case, said that his clients had proved by the highest scientific evidence that, as far as dietetic or food value went, the vinegar in question was equal in every practical respect to that made from malt or grain. Vinegar, he contended, was a generic term to be applied to such substances which were sold as vinegar, and answered the purpose of vinegar, but when one wanted to distinguish one kind of the liquid from the other one must describe what he particularly required. Those who wanted wine vinegar would ask for it; those who wanted grain vinegar would say so, and so on. Vinegar made from pyroligneous acid had been sold for many years, and the makers of the malt-grain vinegar had no exclusive right to the term vinegar. The Act of George III. showed that "vinegar" and "acetic acid" were synonymous terms, for the Act made a person a vinegar-maker the moment he began to purify and rectify acetic acid, and brought himself within the cognisance of the excise. This trade had been in existence for a hundred years, or thereabouts, and its growth had never been attacked till a few months ago. The business had been recognised by legal decisions, and had submitted to the operation of the excise duties upon vinegar. The suggestion that it should be called by some other name than the one under which it had long been regularly sold was a suggestion that would apply to many other articles of commerce. It would be a very serious thing if the Court should come to the conclusion that this was an ille-

gitimate and fraudulent trade, and if the appellants should be compelled to sell their product under another name than that under which they had legally, as he contended, sold it so long.

Mr. Young, in his reply on the whole case, said that the object of such prosecutions as this was that when people asked for one thing they should not be given another. The contention that the defendants were recognised in certain Acts of Parliament for excise purposes as vinegar-makers, and that therefore what they sold as vinegar would, if sustained, enable any person who treated acetic acid in such a way as to come under the excise to sell any of his products, even pure acetic acid, as vinegar. The appellants' case really was that they only were entitled to call their product vinegar, and that the real malt vinegar must be given some specific name.

Mr. Terrell said that the appellants had repudiated this construction of their case. What they contended was, a person asking for vinegar might lawfully be supplied with either of the different kinds.—Mr. Young said that, without putting the words into his friend's mouth, he was quite entitled to say that the effect of their arguments being admitted would be what he had stated. He asked the Court to say that if these people wanted to carry on this trade, with which nobody desired in the slightest degree to interfere, they must carry it on honestly and straightforwardly. When the appellants admitted, as they had admitted, that to get the public to take it it was necessary to give it a false name, and that the public would not take it under any other name, their case was gone. He contended that the term vinegar must be limited to the fermented article, which contained something besides acetic acid, and that acetic acid was not entitled to go through the world with two names, at one time being described as acetic acid, and at another being allowed to masquerade as vinegar.

The Recorder said that he saw no useful purpose to be served by reserving judgment. Having listened very carefully for a day and a half to the arguments so ably adduced on both sides, he thought he was in a position to give his decision at once. The question really was whether the substance which had been sold on this occasion by the appellants could be allowed to bear the name of vinegar. If it ought not to be sold as vinegar, then there had been sufficient prejudice to the purchaser to justify a conviction under the Food and Drugs Act. There was no dispute as to the constitution of the substance. As to whether it was entitled to be called vinegar, counsel for the appellants had, with great skill and perseverance, endeavoured to establish the affirmative on three grounds. The first ground was, that the substance was recognised by law as vinegar. Without going through the Acts of Parliament and the decisions that had been quoted, he (the Recorder) would say that he had come to the conclusion that the contention that vinegar and preparations of acetic acid were in law the same thing could not be accepted. The object of the Acts of Parliament quoted was to take care that certain excise duties were enforced, and for that purpose they enacted that persons who had or received into their custody and possession, amongst other things, any vinegar or acetic acid, or other matters for certain purposes, should be deemed vinegar-makers. Those enactments did not mean to enact that acetic acid should be vinegar, or that the makers or purifiers of acetic acid or pyroligneous acid, although they were to be deemed vinegar-makers for the purpose of these Acts, should be entitled to have the acetic acid which they produced termed vinegar. He thought that the words "deemed to be vinegar-makers" showed conclusively that it was for the purpose of these duties that they were to be taken under the generic name "vinegar-makers," which included a number of things, and he could not hold that it had been recognised by these various Acts of Parliament that dilute acetic acid, coloured, was vinegar. The decisions that had been quoted, and which had reference to excise questions, he interpreted in the same manner, and therefore the argument depending upon recognition by law was unfounded. As to the second point, whether this mixture was entitled by long use to be termed vinegar, evidence had been given that for a great number of years it had been sold as vinegar. On the other hand, it was admitted that the public had not known that it was merely dilute acetic acid coloured that they were buying, and that it had not been discovered by the public till quite recently, when the analysts had found out what the exact constituents of the substance were. Therefore he did not think that this substance had made out its title by long usage to be recognised as vinegar. The third point made by the appellants was that the substance was really vinegar in point of fact. It was clear that before the invention of this substance the original definition of vinegar was a vegetable juice or infusion which had passed through the alcoholic and acetic fermentations. In the "British Pharmacopœia" Professor Attfield defined vinegar as a substance "prepared from the mixture of malted and unmalted grain by acetic fermentation." He was surprised, therefore, to hear Professor Attfield say on Monday that this definition of vinegar, for which he was responsible in so important a publication as the "British Pharmacopœia," was put in simply for the preparation of soap-plaister. On the very same page of the book the Professor,

alluding to vinegar, stated what the dose was to be ; and he could not believe that a gentleman of eminence who was responsible for so important a publication could have been guilty of what would have been unpardonable carelessness of putting in such a definition of such an article as vinegar simply for the purpose of soap-plaister. But in the "Pharmacopœia," in addition to defining vinegar, Professor Attfield had also defined dilute acetic acid. Therefore he (the Recorder) came to the conclusion that as far as Professor Attfield was concerned, the definitions of vinegar and of dilute acetic acid were distinct. Reviewing the other expert evidence, the Recorder pointed out that Mr. Allen had said that dilute acetic acid not produced from any process of fermentation was not true vinegar, but was "as different from it as silent spirit is different from wine." In fact, in the evidence one might just as well be called upon to decide that alcohol and water was wine as that coloured acetic acid and water was vinegar, for alcohol was as much the essential of wine as acetic acid was the essential of vinegar. Therefore the case of the appellant seemed to be a *reductio ad absurdum*. Under these circumstances, he was forced to the conclusion that what was sold in this case was not entitled to the name of vinegar. He did not think there was very much weight in the arguments of the great disturbance of trade that would be caused by a decision adverse to the appellants. In a case of that kind the law could not take that into consideration at all ; but he would point out that a similar argument was used with regard to margarine. It was said that the public would cease to buy margarine if that substance were given its proper name, but it was common knowledge that the margarine trade was now in a more flourishing state than ever before. He had no doubt that his decision in this case—which, if it should be confirmed elsewhere, would have a far-reaching effect—would cause a good deal of disturbance and inconvenience to the manufacturers of this article. The substance, however, was no doubt extremely valuable for many things, and served the purpose of vinegar in many ways, and he could not help thinking that the discussion which had been raised by this case must have shown the public the value of the substance for what it was as well as what it was not. The article appeared to be a valuable thing in itself, and would find its place in commerce, and therefore he did not think that in the end the manufacturers of it would be at any loss. But it was not entitled to be called vinegar, and consequently the appeal must be dismissed, with costs against the appellant.

CORRESPONDENCE.

To the Editors of THE ANALYST.

SIRS,—In THE ANALYST for July last, p. 171, Messrs. Richmond and Boseley state that for the estimation of mixtures of milk-sugar and cane-sugar in milk, "Stokes and Bodmer's method (ANALYST, X., 62) is suitable, but probably not very reliable." (Cf. Hehner, ANALYST, VI., 218.)

On turning to the November number of THE ANALYST for 1881 we find Mr. Hehner's paper on sugar titration, which also was fresh in our minds when we devised the process referred to. Mr. Hehner's experiments are very interesting, as showing that if you replace the necessary caustic potash and Rochelle salt of our solution by sodium acetate, sodium carbonate, or ammonium chloride, you get erroneous results. But they in no way show that the solution containing, as advised by us in THE ANALYST, X., 62, copper sulphate, caustic potash, Rochelle salt and ammonia, does not give reliable results. Mr. Hehner's paper is especially useful in pointing out that you cannot vary the ingredients without varying the results. He lays stress equally on the fact that Fehling's solution itself "only gives correct results when similar conditions are as nearly as possible adhered to." We still frequently use the method for the estimation of sugar in milk, sugar mixtures, and sugar in urine, and find it exceedingly reliable, rapid, and accurate. Other observers also testify to its reliability. We object to our method being, without trial, condemned as "probably not very reliable," merely because a different solution to that which we recommend gave inaccurate results some years before.—We remain, yours faithfully,

Sea Jr 236,

ALFRED W. STOKES.
R. BODMER.

ERRATA.—Page 183, foot-note, *for* $(C_2H_2O)_2O$ *read* $(C_2H_3O)_2O$; *for* 353 *read* 3·53 ; and *for* $(C_2H_2O)OH$ *read* $(C_2H_3O)OH$.